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(54) Dishwashing machine with selectively actuatable spraying means

(57) The washing vessel (4) of the dishwashing machine houses lower (5), upper (6) and intermediate (7) spraying means, which are adapted to be selectively supplied with water under pressure, via hydraulic commutating means (22, 23), to spray respective water jets (10-15) onto tableware items arranged in at least a rack or basket (8, 9). The spraying means (5-7) are adapted to be only actuated one at a time.

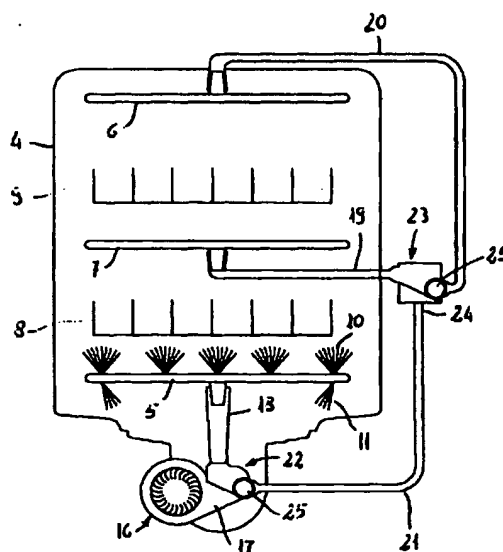


Fig. 1

Description

[0001] The present invention refers to an automatic dishwashing machine of the type comprising a number of selectively actuatable spraying means for washing the dishes.

[0002] Dishwashing machines of the above cited kind are largely known in the art. From the disclosure in EP-A-0 237 994 a dishwashing machine is for instance known, which comprises a washing vessel which houses at least a first and at least a second spraying device that are arranged at respective different levels adjacently to respective tableware support racks, and are adapted to be supplied selectively with water, via an associated hydraulic commutator or diverter arrangement, by a recirculating pump. In an advantageous manner, said hydraulic commutator arrangement is capable of being actuated selectively through the provision of appropriate pauses in the operation of the recirculating pump.

[0003] In the solutions of the type described in the above cited publication EP-A-0 237 994, in particular, the wording "at least a first" and "at least a second" spraying device is understood to mean that one or more first spraying means can be supplied with water by the recirculating pump alternatively to one or more similar second spraying devices by actuating the hydraulic commutator arrangement accordingly. As a result, in the case that the characteristics of the water supply circuit of the first spraying devices are substantially different from those of the water supply circuit of the second spraying devices, the ability of sizing the power output capacity of the recirculating pump in a balanced manner, so as to enable the dishwashing machine to perform correctly in both operational states of the hydraulic commutator arrangement, proves to be an undesirably critical aspect.

[0004] Also known in this connection, for instance from DE-A-3 830 717, is also a dishwashing machine in which the recirculating pump is able to selectively supply, via a hydraulic commutator arrangement, either a first spraying device or a pair of second spraying devices, respectively. In particular, the first spraying device is arranged in the washing vessel of the machine beneath an upper rack, whereas the two second spraying means are arranged beneath a lower rack and above the upper rack, respectively. With substantially similar water flow rate and pressure, such a solution allows for the tableware items on the upper rack to be sprayed from below, ie. in an upward direction, or, alternatively, the tableware items on the lower rack to be sprayed from below and, at the same time, the tableware items on the upper rack to be sprayed from above.

[0005] Basically, the provision of an additional upper spraying device adapted to spray water downwards actually enables the tableware items to be sprayed more thoroughly, ie. in a more complete manner. On the other hand, a balanced sizing of the washing circuit of

the machine can hardly be achieved with this solution while at the same time ensuring the correct efficiency required for each spraying device, which practically means a waste of energy and/or an inadequate operation of the machine in the different operational states of the hydraulic commutator arrangement.

[0006] It is a main purpose of the present invention to provide a dishwashing machine equipped with selectively actuatable spraying means so as to enable the washload items to be sprayed in a complete and fully effective manner, even under different load conditions, while running and performing in an optimal, substantially constant manner, under minimized water usage conditions.

[0007] More particularly, it is a purpose of the present invention to provide a dishwashing machine of the above cited kind, in which the sizing of the means arranged to selectively supply water to said spraying means turns out to be substantially an optimum one under any and all operating conditions of the machine.

[0008] It is a further purpose of the present invention to provide a dishwashing machine of the above cited kind which is capable of spraying the washload in a versatile manner, in accordance with the varying requirements.

[0009] Still a further purpose of the present invention is to provide a dishwashing machine of the above cited kind, which is substantially simple and reliable in its overall construction.

[0010] According to the present invention, such aims are reached in a dishwashing machine with selectively actuatable spraying means embodying the features as recited in the appended claims.

[0011] Anyway, characteristics and advantages of the present invention will become more readily apparent from the detailed description that is given below by way of non-limiting example with reference to the accompanying drawings, in which:

- Figures 1 to 3 are schematical views of the main component parts of a dishwashing machine according to a preferred embodiment of the present invention, under respectively different operating conditions thereof;

- Figure 4 is a view of the dishwashing machine appearing in Figure 3, in a state in which some component parts have been removed therefrom owing to special needs.

[0012] With particular reference to Figures 1 to 3, the dishwashing machine can be noticed to mainly comprise a washing vessel 4 in which there are accommodated at least a first lower spraying means 5, at least a second upper spraying means 6, and at least a further spraying means 7 situated in an intermediate position therebetween.

[0013] In a preferred manner, the spraying means 5, 6

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and 7 are provided in the form of respective rotating spray arms equipped with respective spray nozzles and adapted to be actuated through corresponding supply conduits 18, 19 and 20 so as to spray the washload items that are arranged in at least a rack housed in the washing vessel 4.

[0014] In a per se known manner, at least two such racks are preferably provided in the washing vessel of the machine, which are indicated at 8 and 9, respectively, and are arranged above the rotating spray arm 5 and the rotating spray arm 7, respectively.

[0015] Furthermore, the lower rotating spray arm 5 is preferably adapted to generate wash water jets 10 that are directed upwards, as well as wash water jets 11 that are directed downwards in view of performing a (per se known) cleaning action on a per-se known, and not shown here for reasons of greater simplicity, recirculating filter means lying therebeneath.

[0016] The upper rotating spray arm 6 is preferably adapted to generate wash water jets 12 directed downwards, as well as wash water jets 13 directed upwards so as to at the same time perform a cleaning action on the ceiling of the washing vessel 4.

[0017] The intermediate rotating spray arm 7 is preferably adapted to generate wash water jets 14 and 15, which are directed upwards and downwards, respectively.

[0018] It is anyway to be understood that each one of the above cited spraying means 5, 6 and 7 may be made to comprise a different number of spray nozzles and/or may be made in a different form, for instance in the form of one or more variously oriented nozzles according to the needs.

[0019] In any case, according to the present invention the lower spraying means 5, the upper spraying means 6 and the intermediate spraying means 7 are adapted to be actuated (ie. to be supplied with water under pressure) only one at a time. This of course means that, if one or more of the above cited spraying means, for instance the spraying means arm 6, is formed by a given number of associated rotating spray arms (for example, two or more rotating spray arms 6 associated with each other), all of the nozzles that are part of such a spraying means 6 are adapted to be supplied with water at the same time in such a selective manner, ie. alternatively to the nozzles belonging to the other spraying means 5 and 7.

[0020] Such a selective actuation of the rotating spray arms 5-7 is preferably carried out by means of a recirculating pump 16, whose suction side is connected to the bottom of the washing vessel 4 and whose delivery side 17 is connectable in a selective manner to the conduit 18 or the end portion of a pipe 21 through first hydraulic commutating means 22.

[0021] The opposite end portion 24 of said pipe 21 is in turn connectable in a selective manner to the conduit 19 or the conduit 20 through second hydraulic commutating means 23.

[0022] Said hydraulic commutating means 22 and 23 are actuatable, either directly or indirectly, by the programme sequence control switch of the machine (not shown for reasons of greater simplicity) and may therefore be of any type suitable to the purpose.

[0023] In a preferred manner, anyway, in view of achieving both a constructive and an operational improvement said hydraulic commutating means 22 are provided substantially as described in the afore cited publication EP-A-0 237 994, to which reference should therefore be made for a better understanding. Substantially, the hydraulic commutating means 22 comprise a commutable three-way valve with a shutter 25 of the stable-unstable type adapted to selectively connect the inlet 17, ie. the delivery side of the pump 16, to one of the outlets 18, 21 according to the duration of the pauses in the operation of the pump 16. Furthermore, a calibrated by-pass (not shown for reasons of greater simplicity) connects the inlet 17 to the outlet 21 of the valve 22.

[0024] In a preferred manner, the commutating means 23 comprise a three-way valve similar to the afore cited valve 22, from which it only differs for that fact that its inlet corresponds to the end portion 24 of the pipe 21, instead of the delivery side of the pump 16, so that the two valves 22 and 23 are connected to each other in a cascade-type arrangement. Furthermore, a calibrated by-pass (not shown for reasons of greater simplicity) connects the inlet 24 to the outlet 20 of the valve 23.

[0025] It will of course be appreciated that the commutation times of the valves 22 and 23 can be easily calculated by those skilled in the art to most suitably comply with the actual needs.

[0026] In the actual operation of the machine, therefore, the energization of the pump 16 causes water under pressure to be supplied solely to the lower rotating spray arm 5, since the shutter 25 of the valve 22 starts by initially shutting the outlet thereof towards the pipe 21 (Figure 1). Under these conditions, it is therefore possible for the tableware items contained in the lower rack 8 to be most efficiently washed from below (through the jets 10). Furthermore, the possible presence of the lower jets 11 enables also the recirculation filter to be cleaned automatically (in a per se known manner and not shown in the Figure, as already indicated above).

[0027] If, under the control of the programme sequence control unit of the machine, the pump 16 resumes its operation after a pause whose duration is shorter than a pre-determined period T22, the shutter 25 of the valve 22 shuts then the outlet thereof towards the conduit 18. In addition, the shutter 25 of the valve 23 starts by initially shutting the outlet thereof towards the conduit 20, so that the pump 16 delivers water under pressure solely to the intermediate rotating spray arm 7 (Figure 2). Under these conditions, it is therefore possible for the tableware items contained in the upper rack 9 to be most efficiently washed from below (through the

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jets 14). Furthermore, the possible presence of the lower jets 15 enables the tableware items contained in the lower rack 8 to be submitted to a complementary washing action from above.

[0028] In a per se known manner, it will be appreciated that if the afore cited pause has on the contrary a duration which is longer than said period T22, it is still solely the lower rotating spray arm 5 that keeps being supplied with water by the pump.

[0029] If after a period in which water is so delivered to the intermediate rotating spray arm 7, the pump 16 subsequently resumes operation after a pause whose duration is shorter than a pre-determined period T23 (which preferably, but not necessarily, is equal to the afore cited period T22), the shutter 25 of the valve 23 then shuts the outlet thereof towards the conduit 19. In addition, the shutter 25 of the valve 22 keeps holding the outlet thereof towards the conduit 18 shut, so that the pump 16 delivers water under pressure solely to the upper rotating spray arm 6 (Figure 3). Under these conditions, it is therefore possible for the tableware items contained in the upper rack 9 (as well as in the lower rack 8) to be most efficiently washed from above (through the jets 12). Furthermore, the possible presence of the upper jets 13 enables the ceiling of the washing vessel 4 to undergo a complementary cleaning action.

[0030] It will of course be appreciated that if the afore cited pause has on the contrary a duration which is longer than said period T23 (but shorter than a period T23+T22), it is still solely the intermediate rotating spray arm 7 that keeps being supplied with water by the pump.

[0031] On the other hand, if the above cited pause is longer than a period T23+T22 (ie. long enough in view of enabling the hydraulic circuit 6, 7, 19, 20, 21 and 23 of the machine to substantially empty by gravity through the by-pass provided in the valve 22), it will still be solely the lower rotating spray arm 5 that keeps being supplied with water by the pump in the afore described manner.

[0032] At this point, it becomes fully apparent that, by adequately programming the pauses in the operation of the pump 16, it becomes fully possible for the rotating spray arms 5-7 of the machine to be supplied each time selectively one at a time - upon reaching steady-state conditions - according to any desired sequence, without on the other hand any need arising for such means to be used as commutating means 22, 23 of an electromechanical type and/or involving reliability problems brought about by dirt gathering in the same commutating means.

[0033] In any case, the dishwashing machine according to the present invention enables the tableware items attanged in the racks 8 and/or 9 to be optimally washed and rinsed in a most versatile manner, according to the actual needs and the different load conditions.

[0034] This is achieved by actuating each time a single one of the rotating spray arms 5-7, so that the entire hydraulic circuit of the machine can be advantageously

sized in a most simple, optimum manner, thereby limiting in particular the water usage (since water has only to be provided in an amount as simply required to supply a single rotating spray arm), correspondingly limiting not only the usage of electric energy required to heat up the same water, but also the dimensions and the rating of both the pump 16 and the drive motor thereof, as well as minimizing the hydraulic noise of the whole dishwashing machine.

[0035] It should further be noticed that the dishwashing machine according to the invention allows also for a final "rinsing" phase of the same tableware items to be performed, at the end of at least a washing phase, with only the upper rotating spray arm 6 being actuated. In this phase, therefore, the action of the jets 12 directed downwards enables the dirt particles removed from the tableware, which would otherwise tend to re-deposit onto the same tableware items, to be on the contrary flushed off towards the bottom of the washing vessel 4 (and therefore towards the drain, not shown). In this connection it should be noticed that, in an advantageous manner, the rinsing action performed by the jets 12 (and 13) is not disturbed by the action of the other rotating spray arms 5 and 7 situated therebeneath, in contrast with what actually occurs in other prior-art dishwashers, for example the dishwashers of the type described in the afore mentioned publication DE-A-3 830 717, so that the ultimate cleanliness of the tableware items washed is effectively and advantageously improved.

[0036] Anyway, the dishwasher according to the present invention provides another important advantage. in accordance with the actual needs of the user, in fact, the possibility is given for washing programmes to be carried out to handle tableware items arranged on a single one of the afore mentioned racks 8 or 9, while the possibility is in any case maintained for said tableware items to be sprayed alternately from below and from above thanks to the synchronized action of the rotating spray arms 5, 7 or 6, 7, respectively.

[0037] It will be appreciated that the dishwashing machine illustrated in this description merely by way of non-limiting example may undergo a number of modifications without departing from the scope of the present invention.

[0038] As this has already been mentioned earlier in this description, for instance, at least one of the spraying means 5-7 may comprise fixed nozzles, instead of rotating spray arms, which are situated at different respective levels in the washing vessel 4, for instance along the side walls of the same vessel.

[0039] Furthermore, more than two hydraulic commutating means similar to the afore mentioned means 22 and 23 may be provided in a similar cascade arrangement to selectively supply further spraying means in addition to the spraying means 5-7.

[0040] The dishwashing machine according to the present invention may further be used to carry out "spe-

cial" washing programmes, ie. programmes adapted to enable tableware or similar items to be washed, which are so shaped or sized as to take up a particularly great deal of space vertically. To this purpose, in fact, it is sufficient for the conduit 19 supplying the intermediate rotating spray arm 7 to be provided in the form of a per se known (and not shown) type capable of being connected to the valve 23 releasably. In a preferred manner, the conduit 19 and the therewith associated rotating spray arm 7 are supported by the rack 9 (again in a per se known manner, not shown in the Figure) and are easily removable from the washing vessel together with the rack 9 itself, as shown in Figure 4. As a result, the possibility is so created for items with unusual space requirements vertically to be appropriately arranged in the lower rack 8 and to be therefore washed in an optimum manner thanks to the synchronized action of both the lower spraying means 5 and the upper spraying means 6. Quite important is further the fact that, even under such particular conditions, the possibility is given, similarly to what has been indicated earlier in this description, for an effective final rinsing phase to be carried out on said particularly voluminous items by only actuating the upper rotating spray arm 6, whose water jets 12 (and 13) are not intercepted, in an advantageous manner, by water jets issuing from the lower rotating spray arm 5.

[0041] In order to carry out such a "special" washing programme, the programme sequence control unit of the machine shall of course be appropriately set so as to cause the lower and the upper rotating spray arms 5, 6 to be supplied alternately. In particular, in the preferred case in which the hydraulic commutating means 22 and 23 in said cascade arrangement are of the afore described type with commutable three-way valves provided with a shutter 25 of the stable-unstable type, switching over from the lower rotating spray arm 5 and the upper rotating spray arm 6, and vice-versa, will take place through a transient in which both the outlet 18 of the valve 22 and the outlet 20 of the valve 23 are shut (in a similar manner as illustrated in Figure 2). Such a transient may anyway have a negligibly short duration, so that no need even arises actually for the outlet 19 of the valve 23 to be plugged by specially providing appropriate shutting means that would undesirably make it much more complicated for the user to go through the whole operation.

[0042] As a result, even the special washing process in the conditions illustrated in Figure 4 can be carried out with a single operation of removal of the rack 9, jointly with the intermediate rotating spray arm 7 and the therewith associated conduit 19, that can be performed in an advantageously simple, convenient and quick manner.

Claims

1. Dishwashing machine comprising a washing vessel

accommodating at least first lower spraying means, at least second upper spraying means and at least further spraying means in an intermediate position therebetween adapted to be supplied selectively with water under pressure by means of hydraulic commutating means to spray respective water jets onto tableware items arranged in at least a rack provided in said washing vessel, characterized in that said at least first lower spraying means (5), said at least second upper spraying means (6) and said at least further intermediate spraying means (7) are adapted to be actuated only one at a time.

2. Dishwashing machine according to claim 1, characterized in that said hydraulic commutating means comprise a first and a second three-way commutable valve (22, 23) connected in a cascade arrangement between said spraying means (5-7).
3. Dishwashing machine according to claim 2, characterized in that each one of said commutable valve (22, 23) is of the type provided with stable-unstable shutter means (25) adapted to selectively connect an inlet thereof (17; 24) to one of two outlets (18, 21; 19, 20), wherein a calibrated by-pass is provided between said inlet and one of said outlets.
4. Dishwashing machine according to claim 1, in which said spraying means are adapted to be supplied so as to carry out at least a tableware washing phase, characterized in that said upper spraying means (6) are adapted to be supplied at the end of said washing phase so as to carry out a final rinsing phase for flushing the tableware from above.
5. Dishwashing machine according to claim 2 or 4, characterized in that said further intermediate spraying means (7) are connected to the respective commutable valve (23) in a releasable manner and are adapted to be removed in view of carrying out a washing and/or rinsing phase in which only said lower spraying means (5) and upper spraying means (6) are supplied selectively.

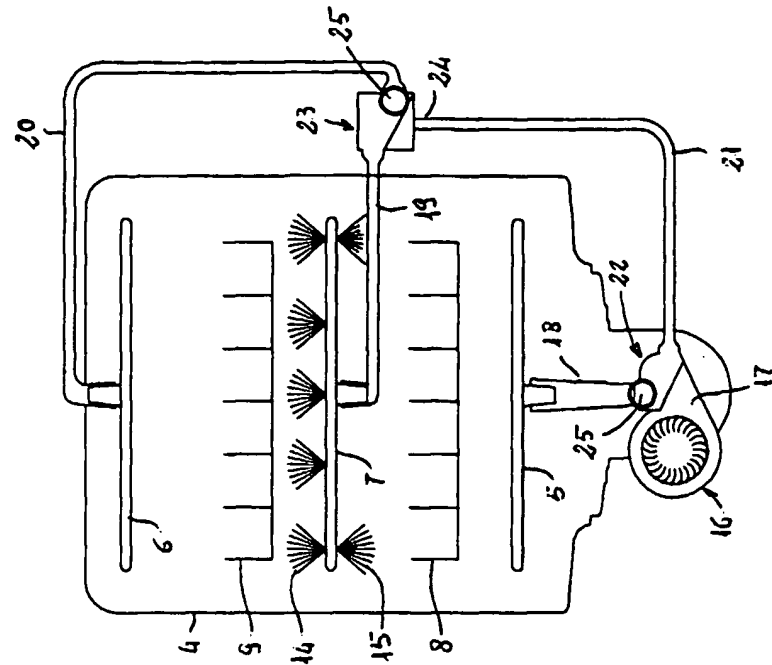


Fig. 2

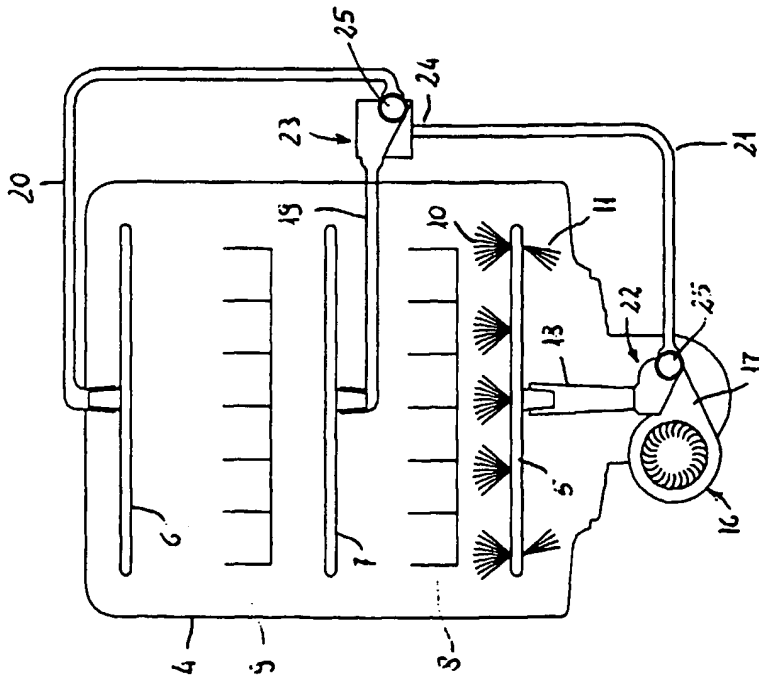


Fig. 1

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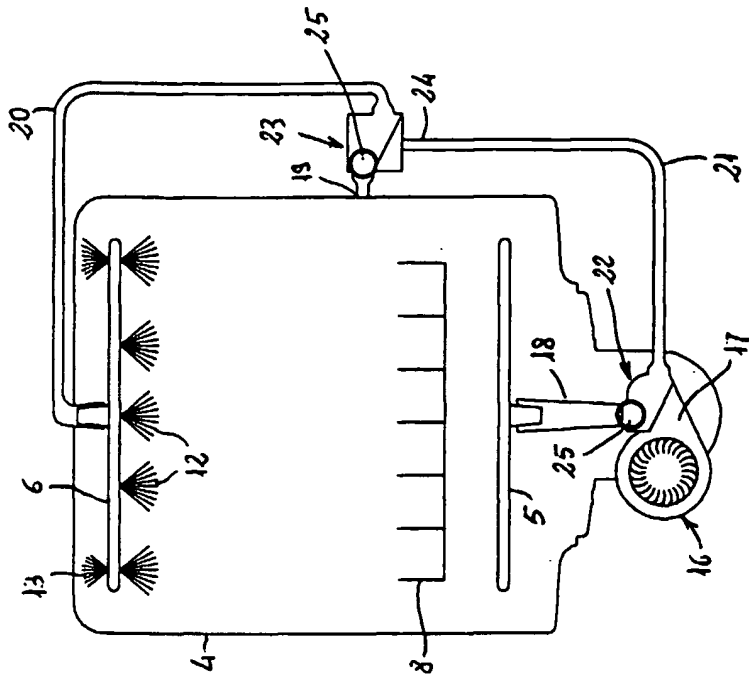


Fig. 4

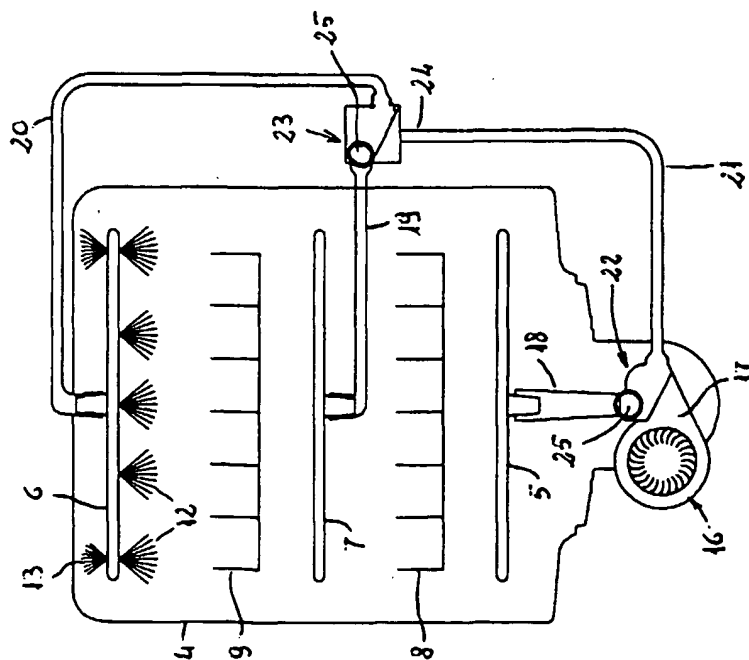


Fig. 3

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Application Number
EP 98 12 3268

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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Y	* page 2, left-hand column, line 42-50 * * page 2, right-hand column, line 1-24 * * page 2, right-hand column, line 54 - page 3, left-hand column, line 10; figures 1,2 *	5	
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			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 14 April 1999	Examiner Laue, F
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 12 3268

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